Washington State Department of Transportation

Memorandum

November 13, 2013

TO: Harvey Coffman
570-2556

FROM: G. Seipel
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SUBJECT: Inspection for Bridge 167/20E Puyallup River

This letter is to inform you of the results of our inspections and my recommendations for the Puyallup River Bridge 167/20E. Our normally scheduled FHWA required inspection of the Puyallup River Bridge began July 28th 2013. Noted conditions at that time indicated that additional inspection was needed. As a result of additional inspection on October 12th and 13th, we instituted a program of cleaning and thorough inspection to key areas of the thru-truss in Span 4. On October 19th, 27th, 28th, and November 11th, our focus was on the interior panel points that have not been readily accessible in past inspections due to heavy accumulations of debris and pigeon guano. Initial probing within these locations, early in the inspection process, found evidence of advanced corrosion.

Cleaning and inspection work has been conducted generally between the hours of 4:00 am 12:00 pm on weekends within varied weather conditions and temperatures around 55 degrees. Inspectors and region maintenance utilized UBIT's and bucket trucks to facilitate cleaning and inspection operations. Operations have included extensive cleaning of debris from the panel points with additional scaling work using needle guns to reduce areas of heavy corrosion. This allowed for more accurate evaluation of the extent of corrosion and remaining material section in structural members and connections.

The bridge is currently under contract for replacement in 2014 and is proposed to be used as a detour bridge during the contract. At the request of the region, we accommodated the contractor's engineer, Kevin Dusenberry, with access to areas of the truss bottom chords once they had been cleaned. Brenden Clarke, from the region Kevin and representatives for Atkinson Construction visited the site, on at least three occasions. Although the priority of work was cleaning and inspection, we were able to provide approximately 2-1/2 to 3 hours of total UBIT time for that access.

You should understand that this report and the conclusions contained herein are the results of a visual examination. No formal calculations, measurements, test, etc. other than those described below have been made. Panel points were cleaned, but no invasive sampling or demolition was conducted. As a result, the report and its conclusions are circumscribed by the inherent limitations of the methods used.

Bridge Description

Bridge 167/20E consists of 6 spans. Span 4, the main span, is a 371 ft. steel through truss built in 1925 and re-built in 1951. The bridge receives Routine and Fracture Critical Inspections on a 24 month frequency and an interim inspection in the off frequency years to monitor the riveted stringer connections. The bridge is currently load restricted due to heavy section loss in the floor beam top flanges.

The truss members are generally dirty with algae growth throughout. Moderate to heavy debris accumulations within the bottom chord at the panel points and on top of the panel points has impeded inspection for many years and promoted corrosion of the steel connections. The paint system is dry, chalky, cracked, and peeling throughout with surface rust, pitting, and active corrosion. Repair request to clean the panel points of the structure have been in place since 2005 and were increased to a priority '1' in 2007.

Heavy traffic on this corridor, the narrow bridge deck, and tight traffic restriction windows make inspection, planning, coordination and conduct difficult.

Observations

The in-depth inspection work cleaned and inspected all twenty six interior panel points consistently finding heavy active corrosion within the panel points once they were cleaned out. Most areas revealed heavy surface rust with scattered areas of minor to moderate laminar rust and pitting up to 1/16" deep. In many locations, approximately 25% of the rivet heads on average exhibit section loss ranging from 10% to 30%. Overall, corrosion has been found to be heaviest in the east truss line and more prevalent in the north half of the span.

In many panel points, gusset plate interior faces display rust pitting and scalloped areas ranging from 1/8" to 1/4" deep running in line along the top edge of the bottom chord. This effectively represents a 50% loss or more of cross sectional thickness in at least six gusset plates. In these locations, rivet heads can generally exhibit section loss up to 90% or more.

At four to six of the twenty six panel points, primarily L1, L2, L12 and L13 of each truss line, heavy to extreme corrosion is present within the bottom chord interior. Corrosion damage includes up to 100% section loss through one or both legs of the bottom steel angle components and rivets of the composite chord member. Observations in these locations are detailed in sketches and photographs within the attached inspection summary.

Many secondary members such as interior diaphragm plates and bottom lateral gusset plates display heavy sections loss due to laminar rust with some being reduced to thin sheets and holed through. Pack rust, measured up to 3" thick, is prevalent within the secondary members and lateral bracing system.

Discussion and Recommendation

Much of the identified corrosion is expected based on previous observation and the history of debris within the panel points, but it could not be fully evaluated or reported on until this inspection. Minor to moderate corrosion found in most areas is not of great concern. However, the cross sectional loss of 50% within the gusset plates is heavier than expected and the full loss of section within the bottom chord components is of particular concern since these are Fracture Critical Tension members that have now been reduced in cross sectional area.

The floor system of this bridge has been an issue of continued maintenance and monitoring for many years. Heavy section loss in the floor beam top flanges resulted in previous load restrictions for traffic and continual loss of rivets in stringer connections has required yearly inspections and repair. Even with several broken rivets replaced during our inspection, at least one additional newly sheared rivet was noted on our last visit.

The findings of our inspection are being incorporated into the FHWA required Routine and Fracture Critical Reports for this structure. Throughout the inspection, our findings were shared and reviewed with the load rating engineer to insure all necessary information was collected and clearly communicated.

A final load rating based on the extent of our findings and the current bridge condition should be made and updated. This should take into account, the previously noted condition of the floor beams, as well as, the detailed condition of the gusset plates and bottom chord components.

As long as the structure is to remain in service, the connections and corrosion within the floor system will need to continue to be monitored and repairs maintained.

Furthermore, I recommended that gusset plate section loss and the bottom chord condition in panel points at L2, L12 and L13 be considered for reinforcement or repairs as part of maintaining the service life of this structure.

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Attachments
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Attachments: Inspection Summary Photo Log